

01  
amt  
cleaning or sanitizing hard surfaces and for hand washing ware in a multibasin sink using at least a washing step involving an aqueous detergent solution followed by a sanitizing step involving an aqueous chlorine based sanitizer solution. The invention further relates to a spray bottle application for sanitizing hard surfaces.

---

Please replace the paragraph from page 5, lines 14-28 with the following replacement paragraph:

---

02  
We have found a unique liquid, solid unit or powdered composition comprising an encapsulated source of halogen, preferably chlorine, and an indicator dye formulated such that a use solution made by diluting the liquid or powdered composition results in an aqueous composition containing an active concentration of a halogen source that can be gauged, estimated or monitored by the depth of color in the solution. We have also found a unique liquid, solid unit or powdered composition comprising a source of acid, an encapsulated source of halogen, preferably chlorine, and an indicator dye formulated such that a use solution made by diluting the liquid or powdered composition results in an acidic aqueous composition containing an active concentration of a halogen source that can be monitored by the depth of color in the solution. In the solid unit, powdered or solid concentrate form, effervescing tablet and/or solid block, this composition is shelf or storage stable for a minimum of two years. We have also found that the depth of color in such aqueous solutions can be used as an indicator of concentration of the active halogen species. Lastly, we have found a number of methods using such solid unit, powdered and liquid materials.

---

Please replace the paragraph from page 5, line 29 to page 7, line 7 with the following replacement paragraph:

---

03  
More specifically, we have found a hard surface cleaning or a hand warewashing method or process including a sanitizing step in which a chlorine based sanitizing solution with a dye is used in the sanitizing step. The sanitizer can be formulated with an active chlorine source and sufficient dye to survive a predetermined period. The sanitizing solution made from the

03  
cont

composition of the invention can also be stabilized using a near neutral or an acid pH in such a way that a soluble dye added to the sanitizer solution can survive and provide color to the sanitizing solution for a predetermined period of time. Such a period of time is an amount of time sufficient to deplete greater than 50%, 60%, 75%, 90% or other predetermined depletion target for the chlorine based oxidant in the sanitizer solution. This means that after a period of time when the solution goes clear or changes color, (i.e.), no original color present, a replenishment of the active chlorine or a new sanitizer use solution is required. The loss or change in color indicates that the concentration of halogen has been reduced significantly and can be reduced to near ineffective levels. This indicates the need for a fresh solution. Monitoring the solution color will allow the personnel to know at all times that a proper sanitizing solution is present. In the sink sanitizer basin, two to six hours is adequate and is a reasonable predetermined period of time. In the other uses including hard surface cleaning, three to twenty four hours is adequate and is a reasonable predetermined time. The length of time between the formation of the solution and the depletion of color can be adjusted by adjusting dye concentration and other active ingredient concentrations in the solid unit, powder or liquid material. The aqueous chlorine containing solutions of the invention can be prepared in two specific embodiments. In a first embodiment, the active chlorine solution can be prepared with an arbitrary pH. Of such pH's are mildly or strongly alkaline. In such a case, an amount of dye is used such that the color of the solution is maintained, even in the presence of the active chlorine sanitizer for a predetermined period. The rates of reaction between the dye and the chlorine based sanitizer can be easily measured at a defined alkaline pH, and an amount of dye is added to the composition to ensure that the dye survives to the end of the predetermined period. Once the dye in the solution is depleted, then the solution can be replaced or refreshed with additional chlorine source and dye. We have also found in an alternate mode, that if used at a near neutral or an acid pH (pH less than about 7) that the dyes are unusually stable. In such a mode, a substantially reduced dye concentration can be used while maintaining an effective color in the sanitizing solutions for the predetermined period of time. We have also found, at active pH, that the active chlorine species possess enhanced antimicrobial activity or sanitizing capacity. Whereas, in alkaline chlorine species, an effective killing of microorganisms can exist at concentrations of the material between 100 and 1000 ppm, at acid pH's the concentration of

C3  
cont the material can be reduced as low as 50 ppm with maintaining effective antimicrobial action.

---

Please replace the paragraph from page 9, lines 16-27 with the following replacement paragraph:

---

C4  
A third aspect of the invention is a solid unit in the form, for example, of a tablet or pellet composition that can be manufactured and used to form the aqueous color stable hypochlorous acid sanitizer materials of the compositions and in the methods set forth above. Simple solid units such as tablets or pellets can be formulated to contain the active ingredients of the stable system. In use, to create an active chlorine aqueous system or to replenish an aqueous system during operations, one or more pellets or tablets of the active materials can be introduced into the appropriate sink or container to create the active materials. Surprisingly, we have found that certain forms of preferred dyes are compatible in long term storage in the presence of highly active chlorine based oxidizing agents or sanitizers. After the dye color disappears or is depleted, the active chlorine can be replaced or augmented with added chlorine composition.

---

Please replace the paragraph from page 11, line 27 to page 12, line 18 with the following replacement paragraph:

---

C5  
The most common chlorine based sanitizer composition comprises sodium hypochlorite derived from an encapsulated source or from aqueous hypochlorite or other liquid and powdered or solid chlorine sources. Aqueous hypochlorite is typically sold in the form of an aqueous solution containing approximately 5-10 wt-% sodium hypochlorate. Solid sources of chlorine include chlorinated isocyanurate powder or encapsulate. Such materials, having a high pH, can be diluted with water to form an oxidizing aqueous solution containing an oxidative species at a concentration of about 50 to about 300 ppm, preferably about 60 to 200 ppm, most preferably 70 to 150 ppm of the oxidative species. Depending on pH, there is an equilibrium (see Figure 1) between hypochlorous acid and hypochlorite according to the following general equilibration reaction in formula I:



CS  
amt

In a common ion effect, as the acid concentration of the solution is increased, the equilibrium of this reaction is pushed towards producing a substantial proportion of hypochlorous acid while minimizing the concentration of hypochlorite. The pH driven concentration relationship between hypochlorous acid (HOCl) and hypochlorite ( $\text{OCl}^{-1}$ ) is shown in Figure 1. An optimum pH, for conservation of dye, is found where the concentration of the hypochlorous acid is maximized while the concentration of hypochlorite is minimized. Preferably, the concentration of (HOCl) is greater than about 80 percent, while the concentration of ( $\text{OCl}^{-1}$ ) is less than about 20 percent.

---

Please replace the paragraph from page 12, line 29 to page 13, line 7 with the following replacement paragraph:

---

CL

The oxidative chlorine concentrate of the invention can contain either a liquid or solid source of halogen. Liquid sources of halogen commonly comprise an alkali metal such as sodium hypochlorite bleach. These materials are commonly available in aqueous solution in a variety of concentrations. A variety of solid chlorine sources are also available such as chlorinated sodium tripolyphosphate, solid dichloroisocyanurate, calcium hypochlorite and others. Such oxidizing agents are disclosed in Kirk-Othmer, Encyclopedia of Chemical Technology, Second Edition, Volume III, pp. 550-566. A preferred source of chlorine comprises an encapsulated chlorine source. Such chlorine sources are shown in Olson et al., U.S. Patent Nos. 4,681,914 and 5,358,635.

---

**In the Claims:**

Please amend claim 9 as follows:

---

CL

9. (Thrice Amended) A particulate composition for forming an aqueous solution having an active chlorine source and a dye, the particulate composition comprising:

- (a) about 1 to 90 wt% of an encapsulated source of chlorine; and
- (b) an effective chlorine indicating amount of dye;